

VISIBLE PLUMES – IMPACT ANALYSIS

Testimony of Dale Edwards

SUMMARY

Energy Commission staff analyzed the potential visual impacts of the proposed East Altamont Energy Center (EAEC) plumes. The proposed project's heat recovery steam generator (HRSG) stack and cooling tower water vapor plumes are predicted to occur at a frequency of 11.8 and 16.5 percent (respectively) of the clear weather seasonal daylight, no rain, no fog (SDNRNF) hours. These occurrences exceed staff's ten-percent frequency threshold, thereby requiring that an impact analysis be done. Staff's analysis has concluded that these plumes will cause adverse but less than significant visual impacts to close-in and more distant viewers.

INTRODUCTION

This analysis focuses on whether water vapor plumes from the proposed East Altamont Energy Center (EAEC) would cause significant adverse visual impacts.

ORGANIZATION OF ANALYSIS

This analysis is organized as follows:

- Description of analysis methodology;

- Description of applicable laws, ordinances, regulations and standards;

- Description of the project's plumes that may have the potential for significant visual impacts;

- Assessment of the visual setting of the proposed power plant site;

- Evaluation of the visual impacts of the proposed project's plumes on the existing setting;

- Evaluation of compliance of the project with applicable laws, ordinances, regulations, and standards;

- Identification of measures needed to mitigate any potential significant adverse impacts of the proposed project and to achieve compliance with applicable laws, ordinances, regulations, and standards.

- Conclusions and Recommendations; and

- Proposed Conditions of Certification.

ANALYSIS METHODOLOGY

Visual resources analysis has an inherently subjective aspect. However, the use of generally accepted criteria for determining impact significance and a clearly described analytical approach aid in developing an analysis that can be readily understood.

Significance Criteria

Commission staff considered the following criteria in determining whether a visual impact would be significant.

State

The CEQA Guidelines define a “significant effect” on the environment to mean a “substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including...objects of historic or aesthetic significance (Cal. Code Regs., tit.14, § 15382).

Appendix G of the Guidelines, under “Aesthetics,” lists the following four questions to be addressed regarding whether the potential impacts of a project are significant:

1. Would the project have a substantial adverse effect on a scenic vista?
2. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?
3. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?
4. Would the project create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

Local

Energy Commission staff considers any local goals, policies, or designations regarding visual resources. Conflicts with such laws, ordinances, regulations, and standards can constitute significant visual impacts. See the section on Laws, Ordinances, Regulations, and Standards.

Professional Standards

Professionals in visual impact analysis have developed a number of questions as a means of evaluating the potential significance of visual impacts (see Smardon 1986). The questions listed below address issues commonly raised in visual analyses for energy facilities. Staff considers these questions in assessing whether a project would cause a significant impact in regard to any of the four CEQA criteria listed above.

Will the project substantially alter the existing viewshed, including any changes in natural terrain?

Will the project deviate substantially from the form, line, color, and texture of existing elements of the viewshed that contribute to visual quality?

Will the project eliminate or block views of valuable visual resources?

Will the project be in conflict with directly identified public preferences regarding visual resources?

Will the project result in a significant reduction of sunlight, or the introduction of shadows, in areas used extensively by the community?

Will the project result in a substantial and persistent visible exhaust plume?

Evaluation Process

The proposed project's plumes would be visible from a number of areas in the project region. Energy Commission staff evaluated the visual impact of the plumes from two key observation points (KOP) along Byron Bethany Road, which represent the view from areas in general at those distances (see the description of KOPs in the Setting section of this analysis). For each KOP, staff considered the existing visual setting and the visual changes that the project's plumes would cause to determine impact significance. Existing condition photographs and plume photo-simulations from each KOP are included in this analysis.

To assess the existing visual setting, staff considered the following elements:

Visual Quality

Visual quality is an expression of the visual impression or appeal of a given landscape and the associated public value attributed to the visual resource. This analysis used an approach that considers visual quality as ranging from outstanding to low. Outstanding visual quality is a rating reserved for landscapes that would be what a viewer might think of as "picture postcard" landscapes. Low visual quality describes landscapes that are often dominated by visually discordant human alterations, and do not provide views that people would find inviting or interesting (Buhyoff et al., 1994).

Viewer Expectation

Viewer expectation is a measurement of the level of viewer interest regarding the visual resources in an area. This analysis also employed land use as an indicator of viewer concern. Uses associated with 1) designated parks, monuments, and wilderness areas, 2) scenic highways and corridors, 3) recreational areas, and 4) residential areas are generally considered to have high viewer expectation as a consequence of the quality of the view. Existing landscape character may temper viewer expectation on some State and locally designated scenic highways and corridors, and on other highways and roads. Commercial uses, including business parks, typically have low-to-moderate viewer expectation, though some commercial developments have specific requirements related to visual quality, with respect to landscaping, building height limitations, building design, and prohibition of above-ground utility lines. Industrial uses typically have the lowest viewer expectation because workers are focused on their work, and generally are working in surroundings with relatively low visual value.

Viewer Exposure

The visibility of a landscape feature, the viewing distance to the landscape feature, the number of viewers, and the duration of the view all affect the exposure of viewers to a given landscape feature. Visibility is highly dependent on screening and angle of view. The smaller the degree of screening and/or the closer the feature is to the center of the view area, the greater its visibility. Increasing distance reduces visibility. Viewer exposure can range from low values for all factors, such as a partially obscured and brief background view for a few motorists, to high values for all factors, such as an unobstructed foreground view from a large number of residences.

Visual Sensitivity

The overall level of visual sensitivity is a function of visual quality, viewer expectation, and viewer exposure and can range from low to high.

To assess the visual changes that project plumes would cause, staff considered primarily the dominance that the plumes would have to the viewer, but also contrast and view disruption.

Dominance

Dominance is a measure of a feature's apparent size relative to other visible landscape features and the total field of view. A feature's dominance is affected by its relative location in the field of view and the distance between the viewer and the feature. The level of dominance can range from subordinate to dominant.

Contrast

Visual contrast describes the degree to which a project's visual characteristics or elements (consisting of form, line, color, and texture) differ from the same visual elements established in the existing landscape. The degree of contrast can range from low to high.

View Disruption

View disruption includes view blockage, which considers the extent to which any previously visible landscape features are blocked from view by the project, and also the breaking up of a view of large landforms such as mountain ranges. Blockage of higher quality landscape features by lower quality project features causes adverse visual impacts. The degree of view blockage can range from none to high.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following discussion of Federal, State, and Local laws, ordinances, regulations, and standards is based on Section 8.11.5 (LORS) of the Application for Certification (EAEC 2001a, pp. 8.11-23 through 28).

FEDERAL

The proposed project is located on private land. Therefore, the project is not subject to federal regulations pertaining to visual resources.

STATE

In the project vicinity, Interstate 580 (I-580) has been designated eligible for State Scenic Highway status (Caltrans 2002). However, at this time, it has not been designated as a State Scenic Highway.

LOCAL

The proposed project is located in an unincorporated area of Alameda County. Therefore, it would be subject to any local laws, ordinances, regulations, and standards

(LORS) pertaining to the protection and maintenance of visual resources in Alameda County.

Applicable LORS from Alameda County are found in the Alameda County East County Area Plan, the Alameda County Scenic Route Element of the General Plan, and the Alameda County Zoning Ordinance. The relevant local LORS and an assessment of the project's LORS consistency are presented in a later section of this analysis.

SETTING

REGIONAL LANDSCAPE

The proposed project would be located in the northeastern corner of Alameda County, east of the Coast Range and on the edge of the Sacramento-San Joaquin Delta within the San Joaquin Valley landscape zone. The region is characterized by flat valley lands generally divided into large fields of row crops with some grazing land, periodically punctuated by the vertical forms of tall trees associated with windrows along field edges and farm dwellings. The flat valley floor appears to extend to the horizon on the north, east, and southeast. To the west and southwest, the landscape is framed by the grass- and brush-covered Coast Range and a sub-unit – the Diablo Range (to the south). The Coast Range in this area is characterized by a set of southeast-northwest trending ridges that are generally 800 to 1,200 feet in elevation, but which in places rise up to higher peaks. The most prominent Coastal Range landmarks visible from the project area are Brushy Peak, which is 7 miles to the west of the project site and 1,702 feet in elevation, and Mount Diablo, which is 19 miles northwest of the project site and 3,849 feet in elevation (EAEC 2001a, p. 8.11-1). The region is also noteworthy for the profusion of wind turbines scattered across the Coastal Range in this area, the numerous electric transmission lines and associated towers converging on the Tracy Substation, and the numerous canals associated with the California Water Project and Central Valley Project, including the California Aqueduct and the Delta Mendota Canal.

Several recreation facilities are also found in the project area. The Livermore Yacht Club functions as a recreational area oriented toward boating and fishing on the Delta waterways. The Rivers End Marina, located adjacent to the Livermore Yacht Club, provides a boat ramp, boat slips, and on-ground boat storage. At the eastern end of Clifton Court Road, approximately 2.3 miles northeast of the project site, portions of the shoreline of the Clifton Court Forebay and the California Aqueduct are open to the public for bank fishing and in season, waterfowl hunting. The Lazy M Marina, which is adjacent to this area, provides a boat ramp, berths, on-ground boat storage, a small restaurant, and cabins. At the Bethany Reservoir located two miles southwest of the site, the California Department of Parks and Recreation operates the 600-acre Bethany Reservoir State Recreation Area. Developed facilities include a boat ramp, dock, and picnic and parking areas. In addition, the facility serves as a staging area for a bikeway that has been developed along the segment of the California Aqueduct that extends southward from the reservoir (EAEC 2001a, pp. 8.11-3 & 4).

PROJECT PLUME VIEWSHED

The distance zones used within this analysis are defined as *foreground* (0 to 1/2 mile), *middleground* (1/2 to 2 miles), and *background* (beyond 2 miles). Within these zones of influence are a number of viewing opportunities. Most foreground to middleground views of the proposed project's plumes would be limited to adjacent and nearby roadways (Byron Bethany, Mountain House, Kelso, and Lindeman Roads) and residences. Viewers would typically be motorists traveling in directions toward the project site and a few scattered rural residents along the roads referenced above. The principal viewing corridor and the area of greatest concern is along Byron Bethany Road. This road carries the most travelers in the immediate project vicinity, and a length of approximately one-mile near the proposed project site has been designated by Alameda County as a scenic route. Mountain House Road is also an Alameda County-designated scenic route.

The unabated plumes from the HRSG stacks and cooling tower (based on a 10% frequency of occurrence using Sacramento 1990 to 1993 meteorological data for seasonal daylight no rain no fog hours from November through April) would reach heights of approximately 425 feet (for the HRSG) and 591 feet (for the cooling tower) during clear conditions and extend downwind approximately 387 feet for the HRSG and 1,397 feet for the cooling tower. Therefore, the viewshed of the plumes would extend substantially farther out across the valley than the viewshed for the structures and would include more distant roadways generally within the area defined by I-5 on the east, I-580 on the south, the Coast Range to the west, and Clifton Court and Howard Roads on the North. Views of the plumes would also be available from Mount Diablo to the northwest and Brushy Peak to the west/northwest. However, because of the approximate 20-mile distance to Mount Diablo, visibility would be low. For Brushy Peak, at a distance of approximately eight miles, visibility would be moderate.

IMMEDIATE POWER PLANT VICINITY

The visual character of the immediate project vicinity reflects several layers of human use. In addition to being an agricultural landscape devoted to large-scale crop production, it is also a landscape in which a large number of water and electric utility infrastructure facilities have been sited, creating a scene that is a mosaic of the rural and technological features. Much of the infrastructure is associated with the nearby transfer point between the California Department of Water Resources' (DWR) California Water Project and the U.S. Bureau of Reclamation's (USBR) Central Valley Project. DWR's 2,180-acre Clifton Court Forebay is 1.3 miles north of the project site. From the Forebay, water passes to the south through the California Aqueduct located to the west of the project site. Also to the west of the project site is the Delta-Mendota Canal with high, grass-covered levees. Immediately west of the project site is the large Tracy Substation, from which a number of electric transmission lines and associated steel lattice transmission towers radiate out across the valley floor, several of which pass close to the project site.

In the area within two miles of the proposed project site, there are four residences with potential views of the project. The residences are individual farm dwellings, which are typically surrounded by outbuildings and trees. Approximately 0.75-mile northeast of the project site, the Livermore Yacht Club includes a small cluster of approximately 30

residences. These residences are built immediately adjacent to the Old River, are oriented toward the water, and do not have views of the project site. Mountain House School, which serves approximately 60 students, is an Alameda County public school located approximately one mile south of the project site along Mountain House Road.

KEY OBSERVATION POINTS

Staff evaluated the visual setting and the proposed project's plumes from two KOPs: (1) Byron Bethany Road at the intersection with Lindeman Road (approximately 0.75 mile southeast of the project site near the access road to the Livermore Yacht Club), and (2) Byron Bethany Road, approximately 2.0 miles southeast of the project site. These KOPs, one near and one far, provide views of the plumes crossing the field of view at nearly a right angle. Due to the low number of residents in the area and low traffic volumes on other area roadways, all but the two Byron Bethany Road KOPs considered in the Visual Resources chapter were discarded for the analysis of visual plumes. A discussion of the visual setting for each KOP is presented in the following paragraphs.

KOP 1 – Byron Bethany Road at Lindeman Road

KOP 1 represents the view to the northwest from the intersection of Byron Bethany and Lindeman Roads (see **Visible Plumes Figure 1**). This viewpoint is approximately 0.75-mile southeast of the proposed site. From this location, the proposed project's plumes would be within the "cone of vision" (45 degrees either side of the direction of travel) of northwest bound motorists on Byron Bethany Road. Byron Bethany Road is an Alameda County-designated scenic route and is a major arterial with an average daily traffic (ADT) level of 13,820 vehicles per day (EAEC 2001a, p. 8.11-8). There are no residences near this KOP; however, there are a few individual scattered residences approximately one mile from the project site. Each of these residences face away from the project site and are surrounded by trees and other buildings that block direct views toward the project site.

Visual Quality

From this viewpoint, the most prominent features in the existing landscape are the roadway with its associated electric distribution lines and poles; the electric transmission lines and towers that appear to become larger to travelers proceeding northwest; the electric transmission structures converging on the Tracy Substation; the Tracy Substation with its complex of vertical forms and lines; the rolling to angular forms and curvilinear lines of the Coast Range including Brushy Peak and Mount Diablo (which is a visible regional landmark) as well as the flat, open agricultural fields that occupy the foreground and middleground. Wind turbines on the hills in the background are visible in the landscape, but they are not dominant landscape features. Although the overall landscape character is rural agricultural, as northwest bound travelers on Byron Bethany Road proceed past KOP 1, the substantial industrial components of the area become increasingly prominent in the view. In addition, Byron Bethany Road is a well-traveled two-lane highway with high traffic volume most of the day, a substantial portion of which are trucks. Considering all of these elements, visual quality is moderate.

Viewer Expectation

Byron Bethany Road primarily serves local traffic. Motorists on this road traveling northwest see conditions changing from a middleground view largely composed of a

rural agricultural landscape, to a foreground with a prominent energy transmission infrastructure presence, and a background with substantial wind turbine development on the east face of the Coast Range foothills. Alameda County has designated the one-mile length of Byron Bethany Road nearest the proposed EAEC site, which is the only part of Byron Bethany Road that is in Alameda County, as a scenic highway. Neither Contra Costa County, immediately northwest of the project site, nor San Joaquin County, just southeast of the site, have designated Byron Bethany Road as scenic. Considering the moderate visual quality experienced by travelers and residents, viewer expectation is moderate.

Viewer Exposure

Plume visibility would be moderate-to-high for motorists traveling northwest at KOP 1 because the view is open and unobstructed at this middleground-to-foreground viewing distance of approximately 0.75 mile. The number of viewers is low-to-moderate, because plumes will only occur for a couple hours per day during the cooler seasons of the year and, although the traffic count for Byron Bethany Road is 13,820 average per day, approximately 2,500 vehicles per day (about 18 percent) would be expected to pass the proposed power plant during plume formation. This estimated number of vehicles is conservatively high because it considers both directions of traffic, and staff's analysis from this KOP is intended to be for travelers to the northwest only. The duration of view (the amount of time the traveler would view the plume when not paying attention to driving) is moderate. Overall viewer exposure for motorists would be moderate.

Plume visibility would be low for residents within the area represented by KOP 1 (within a one-mile radius of the proposed project site) because they are surrounded by trees and other buildings that block direct views toward the project site. This is true for both the individual farm residences, and the approximately 30 residences within the Livermore Yacht Club area. The number of residences with views of the project site is low, and due to the low visibility, the duration of view would also be low. Therefore, overall viewer exposure for residents would be low.

Overall Visual Sensitivity

For northwest bound motorists on Byron Bethany Road, the moderate visual quality, combined with the moderate viewer expectation and moderate viewer exposure, result in an overall visual sensitivity from KOP 1 of moderate.

For residences represented by the view from KOP 1 (those within a one-mile radius of the proposed project site), overall visual sensitivity would be low-to-moderate based on the moderate visual quality and viewer expectation, and low viewer exposure.

KOP 2 – Byron Bethany Road (¼ Mile Southeast of Kelso Road)

KOP 2 (see **Visible Plumes Figure 3**) represents the view to the northwest for northwest bound travelers on Byron Bethany Road, approximately two miles southeast of the proposed project site, and for residences in the one-to-two mile radius of the project site. The traffic count is the same as for KOP 1, 13,820 average per day. There is one residence along Byron Bethany Road, about ¼ mile further to the southeast and, as described previously, there are numerous residences greater than one mile from the

proposed project site. However, similar to residences for KOP 1, these more distant residences typically do not have clear open views toward the proposed project site.

Visual Quality

From this viewpoint, the most prominent features in the existing landscape are the linear form of Byron Bethany Road as it transitions from the foreground to middleground, the numerous electric distribution and transmission lines and poles, the numerous trucks and cars on the two-lane road, open agricultural fields, and two large water tanks in the foreground. Visual quality of this rural agricultural landscape is moderate, reflecting the absence of distinguishing visual characteristics and the influence of the industrial character imparted by the transmission lines and large water tanks adjacent to the roadway.

Viewer Expectation

Northwest bound motorists at KOP 2 anticipate a middleground to foreground rural agricultural landscape and the presence of numerous electric distribution lines and roadway traffic. Overall viewer expectation, considering the moderate visual quality, is moderate.

Viewer Exposure

Visibility of the plume from KOP 2 is moderate because of the two-mile distance and intervening distribution lines and poles, trees, and frequent trucks on the roadway. The number of motorists is low-to-moderate, the same as for KOP 1, and their duration of view is moderate. The resulting overall viewer exposure is moderate.

The number of residential viewers in the approximate one-to-two mile radius represented by KOP 2 is low. The visibility from these residences is low because they are surrounded by trees and other buildings that block direct views toward the project site. The duration of view for residents is low as a result of the low visibility toward the project site. The resulting overall viewer exposure is low.

Overall Visual Sensitivity

For motorists on Byron Bethany Road at this two-mile distance, the moderate visual quality and moderate viewer expectation and exposure result in an overall moderate visual sensitivity.

For residents at the one-to-two mile distance, the moderate visual quality and moderate viewer expectation and low exposure result in an overall low-to-moderate visual sensitivity.

VISIBLE PLUMES

Vapor Plume Modeling Results

The proposed project would include three 175-foot tall HRSG stacks, and a 57-foot tall, 1,030-foot long cooling tower structure consisting of 19 cells. Staff performed an independent psychrometric analysis and dispersion modeling analysis to predict the

frequency and dimensions of visible plumes from the project's proposed unabated cooling tower and HRSG stacks (CEC/Walters 2002).

Staff's frequency threshold for potentially significant visible plumes is a 10 percent or greater frequency of plume formation during the times when plumes would be most visible. Staff has determined that there is the greatest potential for plumes to be visible during seasonal¹ daylight no rain/no fog (SDNRNF) clear sky hours. Using meteorological data and plant operating data, staff applies a sophisticated computer model to predict the frequency of plume formation SDNRNF clear sky hours. If plumes for a project are predicted to reach or exceed the 10% plume frequency threshold, staff performs additional plume dimension analysis.

Staff has identified SDNRNF clear hours as the meteorological conditions during which plumes have the greatest potential to cause adverse visual impacts. For this project, the available meteorological data set categorizes sky cover in 10 percent increments². Staff includes in the "Clear" category a) all hours with total sky cover equal to or less than 10 percent plus b) half of the hours with total sky cover 20-100 percent that have a sky opacity equal to or less than 50 percent. The rationale for including these two components in this category is as follows: a) plumes typically contrast most with sky under clear conditions and, when total sky cover is equal to or less than 10 percent, clouds either do not exist or they make up such a small proportion of the sky that conditions appear to be virtually clear; and b) for a substantial portion of the time when total sky cover is 20-100 percent and the opacity of sky cover is relatively low (equal to or less than 50 percent), clouds do not substantially reduce contrast with plumes; staff estimates this time as approximately half of the 20-100% sky cover hours that have a sky opacity equal to or less than 50 percent..

Assuming duct firing from 10 a.m. to 8 p.m., an unabated HRSG plume is predicted to occur approximately 27 percent of SDNRNF hours, while an unabated cooling tower plume is predicted to occur approximately 40 percent of SDNRNF hours, both well in excess of the 10 percent threshold (see **Visible Plumes Table 1**). It should be noted that the HRSG and cooling tower modeling results reflect the applicant's assertion that duct firing will normally occur during the hours of 10 a.m. and 8 p.m. The cooling tower and HRSG plume frequencies would be higher if duct firing were to occur beyond those hours, and the HRSG plume frequencies would be higher still when power augmentation is used (CEC/Walters 2002). Alternatively, the plume frequencies would be lower if duct firing occurs less than assumed, or when turbines are not operating or not operating at full load. Since both the HRSG and cooling tower plumes are predicted to occur in excess of the 10 percent threshold, staff has conducted a detailed analysis of the visual impacts of these plumes.

¹ "Seasonal" is defined as the six consecutive months per year when the potential for plume formation is greatest. The months considered for a particular project are determined by the meteorological data used for that project. Usually the months are November through April, as is the case for this project.

² These are typically Hourly U.S. Weather Observations (HUSWO) data sets.

As **Visible Plumes Table 1** shows, the project is predicted to produce HRSG plumes 11.1 percent of SDNRNF hours during clear weather conditions, which exceeds the 10 percent threshold. The project is also predicted to produce cooling tower plumes 16.5 percent of SDNRNF hours during clear weather conditions, which also exceeds the 10 percent threshold.

Visible Plumes Table 1
Predicted Vapor Plumes
During Seasonal Daylight No Rain/No Fog (SDNRNF) Hours
Sacramento 1990-1993 Meteorological Data

Measurement Period	Total SDNRNF Hours	Total SDNRNF Hours with Plumes		Plumes During Clear Weather Conditions	
		Hours	Percent	Hours	Percent
HRSG	6,339	1,740	27.4%	745	11.8%
Cooling Tower	6,339	2,555	40.3%	1,048	16.5%

* Percentiles calculated by dividing the number of plume hours by the reference number of seasonal daylight no rain no fog hours (6,339).

Of the plumes in the clear weather category that have the greatest potential for adverse visual impacts, staff selects those plumes with dimensions where the measurement of primary concern (length in this case) would be as great or greater than the plumes predicted for 10 percent of SDNRNF hours. As shown in **Visible Plumes Table 2**, the 10th percentile HRSG and cooling tower plumes during SDNRNF hours, under clear weather conditions, would achieve substantial size. Under clear conditions, HRSG plumes would be approximately 187 feet in length, 285 feet in height, and 47 feet in width, while cooling tower plumes would be approximately 174 feet in length, 298 feet in height, and 124 feet in width. It should be noted that the cooling tower plume length dimension provided is the length of the plume from the tower. The tower itself is 1,030 feet long, so the tower length must be considered when assessing the total visible plume length.

Table 2
10th Percentile Visible Plume Dimensions
During Clear Seasonal Daylight No Rain/No Fog Hours
Sacramento 1990-1993 Meteorological Data

Plume Dimensions	Clear Weather Conditions
HRSG Plumes	
Length (feet)	187
Height (feet)	285
Width (feet)	47
Cooling Tower Plumes	
Length (feet)	174
Height (feet)	298
Width (feet)	124
Seasonal = November through April.	

Visual Impacts of Vapor Plumes

Due to the generally flat terrain in the vicinity of the project site, and the high frequency and large sizes of visible plumes, the plumes would cause a noticeable change in the landscape character when viewed from both near (KOP 1, approximately 0.75 mile) and more distant vantagepoints (KOP 2, approximately two miles). The vapor plumes would appear as prominent, billowing linear-to-irregular forms with irregular and changing outlines. The plumes would be unique moving forms, originating near ground level and rising vertically to diagonally across a background consisting of coastal hills and/or sky.

Visual Impacts from Nearby Viewing Locations - KOP 1

KOP 1 was selected to characterize vapor plume impacts on foreground to middleground viewing locations (up to two miles away). **Visible Plumes Figure 1** is a photograph of the existing view to travelers along Byron Bethany Road near the intersection with Lindeman Road. **Visible Plumes Figure 2** is a simulation of the minimum size of project plumes on clear days as viewed from KOP 1. As can be seen in the simulation, the plumes would be prominently visible to travelers on Byron Bethany Road as the plumes drift almost perpendicular to the direction of travel.

CONTRAST. Under clear conditions when viewed from nearby viewing locations such as KOP 1, the white vapor plumes would have high color contrast with the background blue sky and earthtone colors of the Coast Range hills to the west and north. The vertical and diagonal irregular and changing form of the plumes, substantial plume mass, and plume motion would distinguish the plumes from the broad, horizontal landforms; the generally uniform appearance of sky; and built landscape features. The resulting visual contrast on clear days would be high.

DOMINANCE. During clear conditions, the plumes would be spatially prominent and dominate other built structures and natural landscape features. Therefore, overall project dominance under clear conditions would be dominant.

VIEW DISRUPTION. Under clear conditions, project plumes would block from view portions of sky and portions of the Coast Range hills from the southeast to northwest including Brushy Peak and Mount Diablo. The resulting view disruption under clear conditions would be moderate.

OVERALL VISUAL CHANGE. When viewed from KOP 1 (and other similar vantagepoints in the project area), the values for visual contrast, project dominance, and view disruption taken together constitute a moderate-to-high degree of visual change under clear conditions.

As previously discussed, the overall visual sensitivity for KOP 1 is moderate for motorists, and low-to-moderate for residents. When the anticipated project plumes are considered within the context of the moderate and low-to-moderate visual sensitivity of the existing landscape and viewing characteristics, the moderate-to-high degree of visual change under clear conditions would cause adverse but less than significant visual impacts.

Visual Impacts from More Distant Viewing Locations – KOP 2

Project plumes and their resulting visual impacts would also be apparent from more distant regional vantagepoints (approximately two miles and greater), often with panoramic views across the valley floor to the Coast Range hills to the west and north. From these more distant views, features appear smaller in the broad, open landscape. KOP 2 was selected to characterize vapor plume impacts on background viewing locations. **Visible Plumes Figure 3** is a photograph of the existing view for travelers northwest bound on Byron Bethany Road approximately two miles from the proposed project site. **Visible Plumes Figure 4** is a simulation of project plumes on clear days as viewed from KOP 2.

CONTRAST. Under clear conditions, the white color of the plume would exhibit a high degree of color contrast with the darker blue background of the sky and earthtones of the Coast Range hills. Also, the well-defined diagonal form of the plumes would cause the plumes to stand out from the broad, low-horizontal natural landforms of the valley floor and Coast Range hills and the generally uniform appearance of clear sky. The resulting visual contrast under clear conditions would be high.

DOMINANCE. As represented by KOP 2, under clear conditions the plumes would appear prominent above the low horizon line established by the landforms of the valley floor and Coast Range hills. From those vantagepoints where the Coast Range hills are often visible in the background, the brighter color of the plumes would cause them to stand out from the more subdued earthtones of the hills. As a result, under clear conditions, the plume would be co-dominant in relation to the broad landforms and non-distinct expanse of blue sky.

VIEW DISRUPTION. Under clear conditions from KOP 2 and similar distant locations (two miles and greater), compared to close-in vantagepoints, project plumes would block from view a smaller portion of sky and a smaller portion of Coast Range hills. The resulting view disruption would be low.

OVERALL VISUAL CHANGE. From regional vantagepoints, the values for visual contrast, project dominance, and view disruption, taken together, constitute a moderate degree of visual change.

As previously discussed, the overall visual sensitivity from the more regional vantagepoint is moderate for motorists and low-to-moderate for residents. Combined with the moderate degree of visual change experienced from KOP 2, the project plumes would cause an adverse but less than significant visual impact.

Consideration of Impacts in Relation to CEQA Significance Criteria

This analysis considered the potential impacts of the proposed project vapor plumes in relation to the four significance criteria for visual resource impacts listed in Appendix G of the CEQA Guidelines, under Aesthetics, specified below.

1. Would the project have a substantial adverse effect on a scenic vista?

Scenic vistas in the project region would be available from Mount Diablo (approximately 20 miles to the northwest), and to a much lesser degree, during the time periods that plumes would be visible, from Brushy Peak (approximately eight miles to the west/northwest). Due to the substantial viewing distance from Mount Diablo, the proposed project's plumes would not be prominent features in the landscape and would not cause significant visual impacts. From Brushy Peak, project plumes would be more prominent, but viewers would also see the numerous intervening wind turbines and, due to dirt road and trail access, most viewers would not visit Brushy Peak during the rainy season. In addition, the intermittent nature of plumes, varying form and opacity, contribute to lessening their visual impact. Overall, the proposed project's plumes would result in an adverse, but not significant visual impact from these scenic vista locations.

2. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Although the proposed project's plumes are located within the viewsheds of two Alameda County-designated scenic routes, they are not located within the viewshed of a state scenic highway nor would they damage the types of resources specified in this criterion. Therefore, project plumes would not result in significant visual impacts under this criterion.

3. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

The proposed project's unabated vapor plumes would be prominent but intermittent features when seen from local viewing locations during clear weather conditions, however as discussed in this analysis, impacts on viewers (both vehicular and residential) would be less than significant.

4. Would the project create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?

This criterion is not applicable to the proposed project's plumes.

CUMULATIVE IMPACTS

Cumulative impacts to visual resources could occur where project facilities or activities (such as construction) occupy the same field of view as other built facilities or impacted landscapes. It is also possible that a cumulative impact could occur if a viewer's perception is that the general visual quality of an area is diminished by the proliferation of visible structures (or construction effects such as disturbed vegetation), even if the new structures are not within the same field of view as the existing structures. The significance of the cumulative impact would depend on the degree to which (1) the viewshed is altered; (2) visual access to scenic resources is impaired; (3) visual quality is diminished; or (4) the project's visual contrast is increased.

Staff has identified one other planned project in the viewshed which, when analyzed with the proposed project, may lead to cumulative impacts. The project is the Mountain

House new community, which is to be developed over the next 20 to 40 years. The Mountain House community would be a mixed-use suburban community bounded by the San Joaquin County Line on the west, the Old River on the North, Mountain House Parkway/Patterson Pass Road on the east, and I-205 on the south. The full extent of the Mountain House development is not presently known, but depending on the density of the development and its proximity to both Byron Bethany Road and the Alameda/San Joaquin County Line, which is a middleground viewing distance (approximately 1.0 mile) from the proposed project site, cumulative visual impacts could occur. This conclusion is based on the likelihood that both the proposed project's plumes and elements of the Mountain House Project would be visible in the same field of view of motorists on Byron Bethany Road, and potentially, Kelso Road. The impact could be characterized as a change in the rural agricultural visual character to that of a suburban mixed-use and highly modified landscape. Though the likelihood of a cumulative visual impact is high, the significance of the impact cannot be determined at this time.

The proposed project's plumes, which would be visible only intermittently for a generally short period of the day during approximately half the year (the coolest months), would be added to a landscape that is already heavily impacted by energy infrastructure. This includes the large and very industrial appearing Tracy Substation located on Mountain House Road across from the proposed project site, numerous transmission towers and transmission lines, numerous wind turbines plainly visible on the hills behind the project site, and the proposed EAEC itself should it be approved. The addition of intermittent, short-duration, variable size cooling tower and HRSG water vapor plumes to a setting with the substantial existing energy infrastructure, including the new power plant, would result in an adverse, but not significant cumulative visual impact.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows that the population of people of color is less than fifty percent within a six-mile radius of the proposed project (please refer to **Socioeconomics Figure 1** in this Staff Analysis) and Census 1990 information that shows the low-income population within the same radius is less than fifty percent. However, there is a pocket of people of color within a one-mile radius of the project site (in the Livermore Yacht Club north of Byron Bethany Road) that staff has considered for impacts. Based on the visual analysis, staff has concluded that this population would not have views of the project site and would not experience significant visual impacts as a result of visible water vapor plumes.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

LOCAL

Visible Plumes Table 3 provides a listing of the applicable LORS for Alameda County which pertain to the enhancement and/or maintenance of visual quality and the protection of views. Based on staff's analysis, it appears that the proposed project's plumes would be consistent with the local policies and principles referenced in **Table 3**.

Table 3
Proposed Project's Consistency with
Local LORS Applicable to Visible Plumes

LORS		Consistency Determination Before Mitigation/ Conditions	Basis for Consistency
Source	Description of Principles, Objectives, and Policies		
Alameda County			
Alameda County East County Area Plan	Policy 111 requires that development maximize views of a number of specified “prominent visual features.”	YES	The proposed project plumes are consistent with Policy 111. This policy is directed to shaping urban development to capitalize on views of scenic features which is not pertinent to EAEC. However, EAEC can be evaluated using a broader interpretation of Policy 111 based on the underlying goal the policy addresses – “To preserve unique visual resources and protect sensitive viewsheds.” The far-distant views of Brushy Peak and Mount Diablo by passing northbound motorists on the Byron-Bethany may be briefly and partially obstructed by the proposed project, but these views are not within a “sensitive viewshed.” Therefore, the project’s plumes would not be inconsistent with the goal.
Alameda County East County Area Plan	Policy 197 requires that the County manage development and conservation of land in East County scenic highway corridors to maintain and enhance scenic values.	YES	The proposed project is consistent with Policy 197. This policy is directed to the overall development and conservation of land to preserve and enhance views within scenic corridors, and is not intended as a prohibition of specific projects. The brief partial “blockage” of views by passing northbound motorists of distant geographic features does not diminish the goal to “preserve and enhance views within scenic corridors.” Occasional vapor plumes do not interfere with views or scenic values.
Alameda County General Plan Scenic Route Element Principles	Principle: Provide a continuous, convenient system of scenic routes. Principle: Establish efficient and attractive connecting links. Principle: Provide for unimpeded pleasure driving. Principle: Coordinate scenic routes and recreation areas. Principle: Guide and control preservation and development of scenic routes through legislative standards.	YES	The proposed project’s plumes do not specifically impede the implementation of any of the referenced principles.

Table 3
Proposed Project's Consistency with
Local LORS Applicable to Visible Plumes

LORS		Consistency Determination Before Mitigation/ Conditions	Basis for Consistency
Source	Description of Principles, Objectives, and Policies		
Alameda County General Plan Scenic Route Element Policies	<u>Policy:</u> Provide for normal uses of land and protect against unsightly features.	YES	The proposed project's plumes are consistent with this policy. this policy is intended to all "normally permitted uses"; it does not refer to "historical" uses, nor is it intended to limit uses to historical uses. The proposed project and its plumes are a "normally permitted use." "Unsightly features" as used in the plan, refers to "obtrusive signs, automobile wrecking and junk yards, and similar unsightly development or use of land."
	<u>Policy:</u> Encourage owners of large holdings to protect and enhance areas of scenic value.	YES	The proposed project site does not contain features of scenic value.

MITIGATION

None required.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Based on staff's visible plume analysis, the proposed project's water vapor plumes would cause adverse but not significant visual impacts. This is true for the water vapor plumes' project specific and cumulative impacts.

Staff found the proposed project's water vapor plumes consistent with applicable laws, ordinances, regulations, and standards.

RECOMMENDATIONS

The Energy Commission should consider staff's visible plume analysis in its consideration of certification for the proposed EAEC project.

PROPOSED CONDITIONS OF CERTIFICATION

PLUME-1 The project owner shall ensure that the EAEC cooling tower is designed so that the plume frequency will not increase from the design as certified.

Verification: At least 30 days prior to ordering the cooling tower, the project owner shall provide to the CPM for review and approval the final design specifications of the cooling tower, any associated automated control systems, and related systems selected to meet the requirements of this condition as specified below, and sensors that will be

used for the monitoring required by condition **PLUME-2**. The project owner shall not order the cooling tower until notified by the CPM that the design has been approved.

Exhaust Characteristics for Cooling Tower Cells
(values are per cell)

Ambient Temperature	45°F	45°F	61°F	61°F	98°F	98°F
Relative Humidity	50%	50%	51%	51%	24%	24%
HRSG Firing	Off	On	Off	On	Off	On
Stack Gas Exit Temperature	61.4°F	72.7°F	70.3°F	79.6°F	82.9°F	89.1°F
Stack Diameter	10.26					
Stack Gas Mass Flow Rate	7,265,005 lbs/hr	7,306,279 lbs/hr	7,297,115 lbs/hr	7,340,675 lbs/hr	7,361,817 lbs/hr	7,402,715 lbs/hr

(Source: Data Responses 115, Table VIS-115-1 and 117, Table VIS-117-5 (revised 11/01/01))

The final design parameters of the cooling tower shall include: all parameters as listed in the table above, and the physical size of the cooling tower, the cell exhaust diameter, the fogging frequency curve for the cooling tower, the design L/G (liquid/gas) ratio, and the curve equation to determine the operating exhaust temperature based on the ambient temperature, relative humidity, and heat rejection load condition.

PLUME-2 The project owner shall ensure that the EAEC cooling tower is operated so that the plume frequency will not increase from the design and operating characteristics specified in condition **PLUME-1**.

Verification: By May 15th of each year that the cooling tower operations monitoring is required, the project owner shall provide to the CPM the cooling tower operating data for the previous November through April period. The project owner shall include with this operating data an analysis of compliance and shall provide proposed remedial actions if compliance cannot be demonstrated.

The project owner shall monitor the operation of the cooling tower to ensure that it is operated in a manner consistent with the operating variables specified in condition **PLUME-1**. The project owner shall monitor and record the hourly inlet airflow rates, the hourly operating L/G ratio, the heat rejection load, the hourly ambient temperature and relative humidity, and the corresponding hourly exhaust temperature of the cooling tower. This monitoring shall occur from November through April each year until compliance is demonstrated for three straight years, and may be required again at a later date as determined necessary by the CPM. The cooling tower data shall be provided for each cell unless the project owner can demonstrate that each cell operates identically. Compliance shall be demonstrated if the tower operates within the proposed exhaust temperature vs. operating condition curve equation (i.e., exhaust temperatures at or below the predicted values).

PLUME-3 The project owner shall ensure that the EAEC HRSGs operate so that the plume frequency will not increase from the design as certified.

Verification: By May 15th of each year that the HRSG operation monitoring is required, the project owner shall provide to the CPM the HRSG operating data for the previous November through April period.

The project owner shall monitor the operation of the HRSGs to ensure that they are operating as proposed. The project owner shall monitor the average hourly exhaust temperature and the turbine and duct burner natural gas firing rates; and shall estimate the hourly average moisture content of the exhaust. The hourly HRSG operations monitoring data shall be provided for each HRSG. This monitoring shall occur from November through April each year until compliance is demonstrated for three straight years, and may be required again at a later date as determined necessary by the CPM. The project owner shall include with this operating data an analysis of compliance and shall provide proposed remedial actions if compliance cannot be demonstrated. Compliance shall be demonstrated if the HRSGs exhaust temperatures are as provided in the table below (i.e. exhaust temperatures at or higher than the values provided).

Exhaust Characteristics for HRSGs
(note: data is per HRSG)

Condition	Moisture Content (% wt)	Exhaust Flow Rate (lbs/hr)	Exhaust Temperature (°F)
Full Load with duct firing and power augmentation			
Hot Ambient (98°F, 24% RH)	9.33%	3,478,379	155
Full Load with duct firing, without power augmentation			
Average Ambient (61°F, 51% RH)	7.27%	3,597,052	155
Full Load without duct firing, without power augmentation			
Cold Ambient (45°F, 50% RH)	5.37%	3,641,095	188
Average Ambient (61°F, 51% RH)	5.42%	3,509,159	185
Hot Ambient (98°F, 24% RH)	5.60%	3,172,645	189

(Source: Data Response 119, Table VIS-119-1, with the duct-fired exhaust temperature as amended on October 31, 2001.)

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- EAEC (East Altamont Energy Center) 2001a. Application for Certification, Volume 1 & Appendices, East Altamont Energy Center (01-AFC-4). Dated March 20, 2001 and docketed March 29, 2001.
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EAST ALTAMONT ENERGY CENTER VISIBLE PLUME STAFF ASSESSMENT - SUMMARY OF ANALYSIS															
(Does Not Include Cumulative Analysis)															
VIEWPOINT		EXISTING VISUAL SETTING							VISUAL CHANGE					IMPACT SIGNIFICANCE	
Key Observation Point (KOP)	Description	Visual Quality	Viewer Expectation	Viewer Exposure				Overall Visual Sensitivity	Description of Visual Change	Visual Contrast	Project Dominance	View Disruption	Overall Visual Change	Mitigation / Conditions	Impact Significance with Mitigation
				Visibility	Number of Viewers	Duration of View	Overall Viewer Exposure								
KOP 1 BYRON BETHANY (Approximately one-mile from project site) Figure 1 and 2	View to the northwest from intersection of Byron Bethany and Lindeman Roads.	Moderate Foreground to middleground flat agricultural landscape with numerous electric transmission lines and substantial traffic, backdropped by rolling hills with numerous wind turbines, and more distant Brushy Peak and Mount Diablo (which is a visible regional landmark).	Moderate Motorists traveling northwest on Byron Bethany Road anticipate a middleground to foreground agricultural landscape and the presence of energy infrastructure and traffic, as well as unobstructed views of the hills beyond and Mount Diablo.	Moderate to High	Low to Moderate	Moderate	Moderate	Moderate	Addition of prominent billowing linear-to-irregular forms with changing outlines. Plume mass would appear similar to surrounding facilities at this middleground to foreground viewing distance.	High	Dominant	Moderate	Moderate to High	None	Adverse but Not Significant
KOP 2 BYRON BETHANY ROAD (Approximately two-miles from project site) Figure 3 and 4	View to the northwest along Byron Bethany Road, two miles southeast.	Moderate Foreground to middleground flat agricultural landscape with numerous electric transmission lines and substantial traffic in the foreground to middleground of views backdropped by rolling hills and wind turbines.	Moderate Motorists traveling northwest on Byron Bethany Road anticipate a foreground to middleground agricultural landscape and the presence of energy infrastructure and traffic.	Moderate	Low to Moderate	Moderate	Moderate	Moderate	Addition of noticeable billowing linear-to-irregular forms with changing outlines. Plume mass would appear co-dominant with other features in view at this background to middleground viewing distance.	High	Co-Dominant	Low	Moderate	None	Adverse but Not Significant